

# Gallstones and cholecystectomy in modern Britain

M C Bateson

## Abstract

**Background**—It has been suggested that gallstone disease is now commoner, and that this might explain an increase in cholecystectomy rates, though conclusive evidence has been lacking.

**Methods**—All the non-forensic necropsy results for Dundee 1953–98 were examined to assess the prevalence of gallstone disease. The NHS Scotland annual cholecystectomy figures were extracted from their earliest availability in 1961 up to the present. The subgroup of patients from Dundee was analysed separately, as were laparoscopic procedures, which were recorded from 1991.

**Results**—Gallstone disease was much commoner in 1974–98 than in 1953–73. Increasing age was the main determinant of gallstone disease. Though gallstone disease was commoner in women than men aged 40–89, there was no sex difference under 40 or over 90 years. Cholecystectomy became much commoner in the 1960s when frequency of gallstone disease did not change. It increased further in the 1970s, peaking in 1977–8. There was a gradual fall in rates in the 1980s when gallstone prevalence remained high. There was a further moderate rise in the 1990s after the wide introduction of laparoscopic cholecystectomy. Cholecystectomy is now much commoner in young women and this change started in the 1960s. By contrast, cholecystectomy in men has become more prevalent in the older age group.

**Conclusions**—Gallstones were definitely more common in both sexes at all ages over 40 in the last 25 years. Changes in the cholecystectomy rates are only partly explained by changes in gallstone prevalence, and are more determined by surgical practice.

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Gallstone prevalence can be assessed by various techniques such as ultrasonography,<sup>1,2</sup> cholecystography,<sup>3</sup> and necropsy survey.<sup>4–10</sup> Each technique has its drawbacks but results are comparable in the same population when standardised for age and sex.<sup>9</sup> Gallstone disease prevalence is defined as those subjects with the proved presence of gallstones plus those with evidence of cholecystectomy.<sup>6</sup> Since 70% of gallstones are asymptomatic in life, clinical disease and its surgical treatment are not accurate methods of measuring prevalence.<sup>1,11</sup>

It is only possible to obtain historical comparisons from necropsy data because serial ultrasonography or oral cholecystography surveys have not been performed in Britain.

Gallstone disease is the explanation for almost all gallbladder surgery. In Britain about 90% or more cholecystectomies were performed under the NHS; NHS data allow an opportunity to compare therapeutic activity with disease rates.

## Methods

### GALLSTONE DISEASE PREVALENCE

Necropsy records from the Dundee hospitals were scrutinised excluding fetal and neonatal deaths for the period 1974–98, and compared with an earlier similar study 1953–73.<sup>6</sup> Details of the biliary tract were available in 90.1% of necropsies, much higher than the 72% of subjects who will agree to ultrasound screening.<sup>11</sup> Gallstone disease was defined as the presence of gallstones in the gallbladder or bile ducts, or the absence of the gallbladder after surgical removal. Overall 1.1% of deaths related to gallstones or their treatment. Almost all gallstone disease was, therefore, incidental to hospital admission leading to necropsy. Results were analysed by decades of age and sex.

Comparisons were made by  $\chi^2$  test, or by Fisher's exact test where numbers were small.

### CHOLECYSTECTOMY

The number of cholecystectomies in the NHS in Scotland were obtained for 1961–98 from the NHS Scotland's Common Services Agency and subsequently Information Services Division. For 1996–97 and 1997–98 data were collected by financial years rather than calendar years as previously. Numbers were stratified by decade of age and sex. Only total cholecystectomies were recorded until 1991, after which laparoscopic and open cholecystectomy were recorded separately to give the total. Information for the Dundee hospitals was separately analysed to give as close a comparison with the necropsy prevalence data as possible.

## Results

### GALLSTONE PREVALENCE (FIGS 1–3)

There was a highly significant increase in gallstone disease prevalence in the later period. Over the age of 50 years there was more gallstone disease for both sexes in 7219 necropsies in 1974–98 than in 9364 necropsies in 1953–73. There was also a trend to greater rates of gallstone disease in men and women aged 10–39 in the later period, but the numbers of necropsies were small and this was not significant for women.

Over the age of 90 gallstone disease was present in equal proportions in the two sexes in 1974–98, and this was also true under the age of 40. Otherwise women had more gallstone disease than men. In the last 10 years (1989–98) 20.3% of gallstone disease subjects had actually had a cholecystectomy and there was no sex difference.

Department of  
Gastroenterology,  
Bishop Auckland  
General Hospital,  
Cockton Hill Road,  
Bishop Auckland,  
County Durham  
DL14 6AD, UK

Correspondence to:  
Dr Bateson

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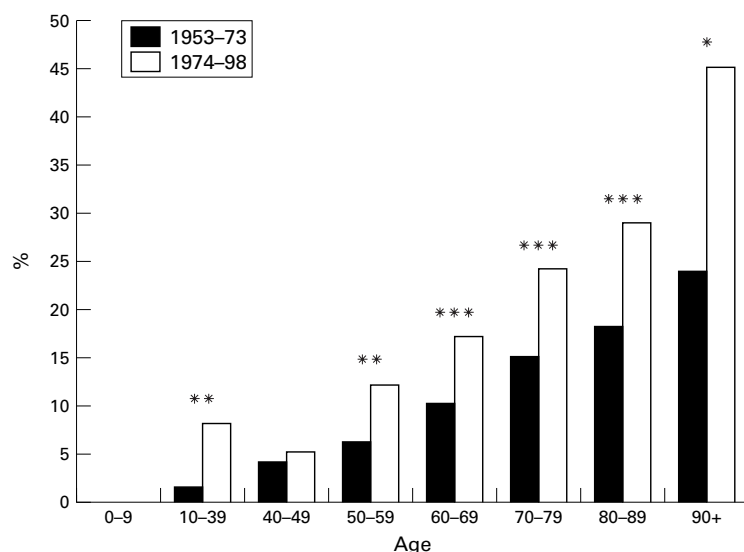


Figure 1 Gallstone prevalence in males; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

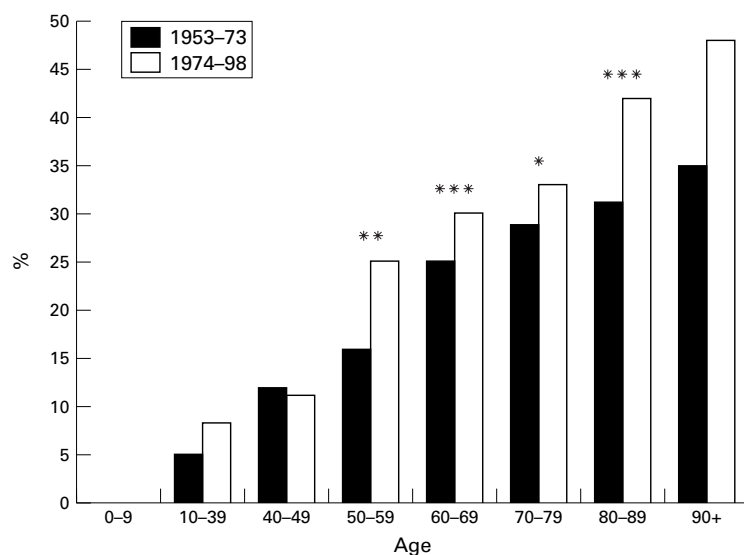


Figure 2 Gallstone prevalence in females; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

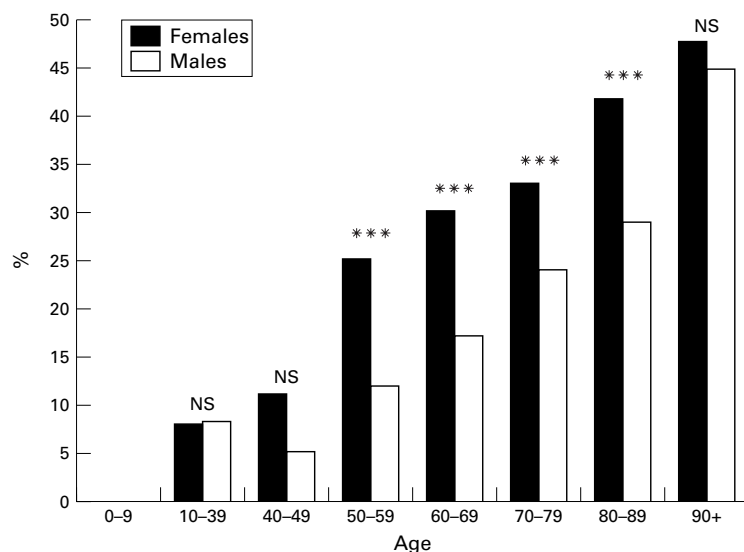


Figure 3 Necropsy prevalence of gallstone disease 1974-98 ( $n = 7219$ ); \*\*\* $p < 0.001$ .

Detailed three year analysis showed that a marked increase in gallstone disease occurred in 1974-98. Previously there had been fluctuations but no clear trend.<sup>12</sup> By contrast 213 necropsies in 1902-10 and 167 necropsies in 1936-38 showed identical standardised prevalence to the whole period 1953-73.<sup>6</sup>

#### CHOLECYSTECTOMY (FIGS 4-6)

The population of Scotland has remained constant at 5.1 to 5.2 million over the last 40 years so absolute numbers of cholecystectomies are equivalent to rates per head of population.

There was more than a doubling of numbers of cholecystectomies from 2449 in 1961 (the earliest date figures were recorded) to 5722 in 1977. There was then a dip in numbers in 1981-82, probably explained by industrial action in the NHS, but the 1980s were marked by a moderate reduction in numbers to 4511 in 1988. After 1990 this was reversed so that the numbers of operations have risen over the last five years. All these changes were very highly significant (1977 *v* 1997-98 ( $p < 0.005$ ); all other comparisons ( $p < 0.001$ )).

It is thought that the first UK laparoscopic cholecystectomy was performed in Dundee in October 1987, but statistics for Scotland were only collected separately for this procedure from 1991 onwards. Most cholecystectomies have been laparoscopic after 1993 and this change in technique has been simultaneous with the rise in total cholecystectomy numbers. The local Dundee figures illustrate this. There were 210 cholecystectomies in 1989, 274 in 1996-97 (187 laparoscopic), and 257 in 1997-98 (172 laparoscopic).

There were noticeable changes in the sort of patients coming to cholecystectomy. In 1961 only 17% of operations in women were performed between the ages of 10-39 years. This rose to 25% in 1971, and stayed at this level, being 27% in 1987 and 24% in 1997-98 ( $p < 0.001$ ). The actual number of operations was much greater in the later periods. No such changes were seen for men in this age group, but by contrast a large increase was seen in the proportion of operations carried out in males 70-99 years, from 13% in 1961 to 25% in 1986 and in 1997-98 ( $p < 0.001$ ).

#### Discussion

There have been various attempts to establish that the frequency of gallstones in Britain has increased over the years, but the information has been difficult to assess. For instance the cholecystectomy rate itself does not correlate at all well with gallstone disease,<sup>12</sup> and a previous necropsy study in 1978-88 appeared to show that gallstones became commoner in men but were no more frequent in women.<sup>13</sup>

There are no serial ultrasonography studies to make comparisons, but the prevalence at necropsy in the current series is similar to that found in a simultaneous cross sectional study of women by ultrasonography in Oxford.<sup>14</sup> The Dundee data for 1953-73 are equivalent to large necropsy series in Leeds 1910-26<sup>4</sup> and 1930-49<sup>5</sup> suggesting that there was no change in prevalence up to the 1970s. The number of

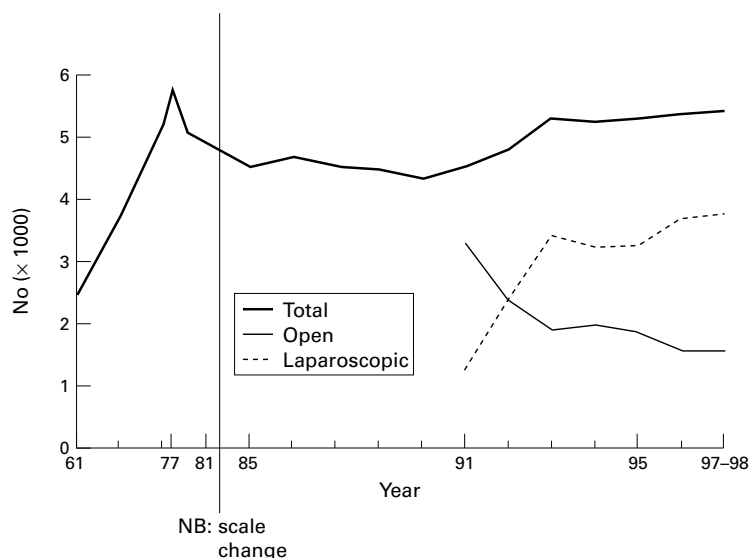


Figure 4 Cholecystectomy in Scotland 1961–98.

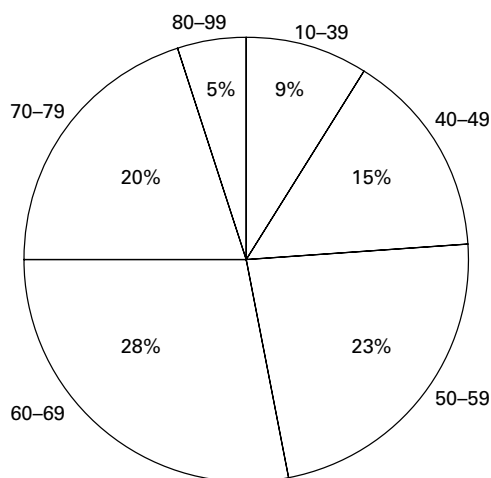


Figure 5 Cholecystectomies in Scottish males by age 1997–98 (n = 1300).

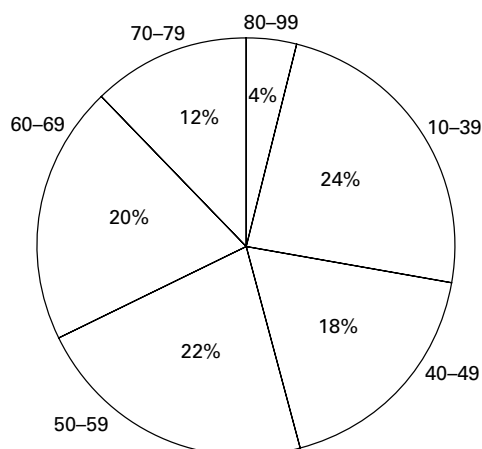


Figure 6 Cholecystectomies in Scottish females by age 1997–98 (n = 4099).

necropsies has declined having previously risen to a peak of 693 in 1976 in Dundee and now being about 150 annually. This should not influence gallstone disease prevalence but restricts the amount of data available every year.

The definite significant increase in gallstone prevalence in the last 25 years in Britain is not merely accounted for by the aging population. It is supported by a Romanian necropsy study comparing 1873–82 with 1973–82.<sup>10</sup> Its explanation is not clear, but the population is known to be heavier, which is a risk factor for cholelithiasis.<sup>15–17</sup> Disappointingly for the obese, weight reduction by dieting and bariatric surgery<sup>17–21</sup> both further increase the prevalence of gallstones, so that prophylactic measures are justified during rapid weight loss. The modern trend to obesity and consequent attempts at dieting may, therefore, both explain some of the increased risk of gallstone disease. Cyclical fluctuation in weight related to dietary manipulation is an independent risk factor.<sup>20</sup> Not only is obesity a risk factor for gallstones, higher energy intakes have also been found to be a significant factor which is what might be expected.<sup>17 22 23</sup>

The attempt to correlate specific foods with gallstone formation has yielded some inconsistent results. Vegetarianism is protective against gallstones,<sup>14</sup> but its actual prevalence in the community may or may not be changing and many self reported “vegetarians” do take fish and/or meat. Moderate alcohol intake is a protective factor against gallstones.<sup>22 24</sup> This is of some interest as alcohol intake has increased since 1950, but this is clearly insufficient to counteract the trend to increasing gallstone prevalence. Whether intake of vegetables, fibre, and polyunsaturated fats or olive oil in omnivores can be protective is rather doubtful.<sup>24–26</sup> Fats, proteins, and refined sugars have all been proposed as risk factors for gallstones<sup>22 25</sup> but the evidence is not conclusive.

Smoking has definitely fallen in frequency in the community, but its relationship to gallstone disease is very controversial indeed.<sup>24–28</sup> The less active lifestyle associated with modern times could also be a risk factor for gallstones.<sup>25</sup>

An interesting hypothesis has been proposed linking modern dietary practices with gallstones. Low residue diets such as those based on snacks and convenience foods lead to slow intestinal transit and hence increased formation of the secondary bile acid deoxycholic acid from the primary bile acid cholic acid in the gut. The presence of increased deoxycholic acid in the enterohepatic circulation of bile could then lead to cholesterol oversaturation of gallbladder bile and gallstone formation.<sup>29–32</sup> However, there is no established regular link between slow intestinal transit and gallstones, it has not been universally found that deoxycholic acid is increased in the bile of gallstone patients,<sup>33</sup> and a high roughage diet definitely does not protect from reformation of gallstones after dissolution therapy.<sup>34</sup>

Though drugs such as octreotide, clofibrate, and possibly hormone replacement therapy increase gallstone prevalence, this is unlikely to affect the whole population in a large way.

The increasingly widespread use of the oral contraceptive pill after 1961 did not affect gallstone prevalence.<sup>35</sup>

The large increase in gallstone disease might be felt to explain the rise in cholecystectomy, but the picture is much more complicated. During

### Learning points

- Gall stone disease was much commoner in the last quarter of the 20th century than ever before
- Previously rates had been stable for many years
- Cholecystectomy figures have changed for Scotland, though the population size has not—1961: 2449; 1977: 5722 (rapid marked rise); 1988: 4511 (moderate fall); 1997–98: 5399 (further increase)
- Increased cholecystectomy rates in the 1990s probably reflect the popularity of laparoscopic surgery

the 1960s when gallstone prevalence was known not to have changed there was an increasing operation rate. In the 1970s there was an increase in both gallstone disease and cholecystectomies, but then the surgical rate declined after 1977 while gallstones remained much commoner than previously. The introduction of laparoscopic cholecystectomy had a profound influence on surgical practice and it seems likely that enthusiasm for this new technique explains the rise in cholecystectomy rates in the 1990s.<sup>36</sup>

The overall pattern of surgical activity does not relate at all closely to gallstone disease prevalence and its changes. The marked increase in cholecystectomy in young women occurred in parallel with the introduction of the oral contraceptive pill. It is likely that women taking the oral contraceptive pill will have more frequent contact with doctors and so consequently abdominal symptoms may be more vigorously investigated and treated as a result. Women on the oral contraceptive pill come to cholecystectomy earlier than those who are not.<sup>35</sup>

Why older men should have had such an increase in surgery is difficult to explain. It may be the fact that gallstone disease is associated with age much more strongly than sex has become generally appreciated. It seems unlikely that gallstones cause symptoms more often in men than women as the current cholecystectomy rates for those with gallstones are the same in the two sexes.

### Update

In 1998–99 there were 5428 cholecystectomies in the Scottish NHS, 72% laparoscopic. Of 4071 operations in women, 26% were in the age group 10–39 years. There were 277 Dundee cholecystectomies, 69% laparoscopic.

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